

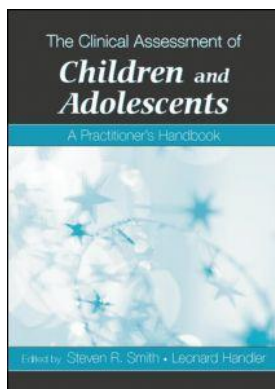
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ASSESSMENT OF THINKING PROBLEMS IN CHILDREN

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The assessment of thinking problems in children requires a clear conceptual definition of thinking disturbance. It then requires a careful understanding of the role developmental factors play in the manifestation of the thought processes covered under the term *thought disturbance*. Alternative methods of assessing thought disorder can then be reviewed in an effort to evaluate the advantages and disadvantages each presents. These can be evaluated both in principle, as a function of the nature of the phenomenon, and as they relate to the capabilities and characteristics of different age groups. In this chapter we attempt to examine each of these issues. We then attempt to present some descriptive data concerning psychometric manifestations of thinking disturbance in a sample of psychiatrically hospitalized children. Finally, we present a case example of a child for whom psychometrically measurable thinking disturbance was found to be a predictor of the eventual emergence of a more severe psychiatric disorder.

ISSUES DEFINING DISORDERED THINKING

Kleiger (1999) has comprehensively reviewed the problems that arise in the attempt to assess disordered thinking. These include the distinction between the more traditional notion of thought disorder and that of communication problems or discourse failures (Andreason, 1982; Harvey, 1983; Docherty, 2005); differentiating positive and negative manifestations of thought disorder (Andreason, 1982, 1984a, 1984b); and the implications of unifactorial versus multifactorial, or dichotomous versus continuous, models of thought disorder. Klieger (1999) observes that, despite the general agreement that disordered thinking exists along a

continuum of severity, the dichotomizing and categorical term *thought disorder* continues to appear in both clinical discussion and scholarly writing.

Klieger notes that although it has been generally acknowledged that qualitatively different manifestations of disturbed thinking have been identified by almost every investigator who has studied thought disturbance, and some of these appear to have differential diagnostic or prognostic significance, as yet there is no consensus as to the types or kinds of disturbed thinking that exist. Many of the terms that are used for classifying and quantifying thought disturbance continue to be used differently by different authors. It appears that most authors include within their definitions of disordered thinking thought processes marked by illogical reasoning, connections among ideas that are difficult for the listener to follow, and the combination of ideas in ways that are unconventional, unrealistic, or bizarre. It appears that adequate thinking is defined, by implication, as thinking that is logically conventional and coherent, indicated by speech that moves from topic to topic in a manner that is not misleading or confusing to the audience, and is based on ideas that are drawn in an acceptable manner from the real world. To the extent that one's thinking lacks these characteristics, it is more likely to be seen as disordered.

Obviously, definitions of thought disorder that include these elements imply that the quality of one's thinking at any point in time can be thought of as falling along a continuum that ranges from unassailably logical, conceptually conventional, and clearly articulated thought to logically incoherent and bizarre thinking that is communicated in an arbitrary and confusing manner. Although the latter is characteristic of individuals who are in a psychotic state, the former, at its extreme, would appear to constitute an ideal that few people consistently manifest. Within such a conceptualization the issue becomes one of adequately identifying one's position on this hypothetical continuum and determining its diagnostic, prognostic, and therapeutic implications. The precise boundary between "disordered thinking" and thinking that is not disordered becomes somewhat arbitrary, and the term *thought disorder* becomes nothing more than a convenient term for a level of severity of thinking problems, and not a categorical distinction.

Developmental Considerations

If thinking disturbance is conceptualized as one's position on a continuum of conventionality, logical coherence, and clarity of communication of one's thinking, then the primary developmental issue related to thinking disturbance in children is whether or not there are normal developmental changes in an individual's position on that continuum. In other words, in normal children, does the coherence of the logic of their thinking, the conventionality of their concepts and ideas about the world, and the adequacy with which they communicate their thinking change significantly and systematically as a function of their chronological age and psychological maturity? A secondary developmental issue is the impact that an individual's age has on the methods of assessment that may be used to quantify these aspects of thinking.

Theoretical works from varying perspectives (e.g., Athey, 1986; Leichtman, 1986; Caplan & Sherman, 1990), normative data (Exner, 2003; Exner & Weiner, 1995), and studies of children using thought disorder measures (e.g., Arboleda & Holzman, 1985) typically show that the frequency of occurrence of thinking problems changes significantly as a function of normal development. Many authors believe, and empirical data suggest, that normal children are prone to combine concepts and engage in less logical thinking to a greater extent than normal adults. As normal children develop, it appears that the frequency and severity

of these kinds of thinking problems steadily decline. This then implies that the threshold for distinguishing normal from clinically disordered thinking must be empirically adjusted to account for this developmental trend. Data supporting this point of view can be found in the work of Arboleda and Holzman (1985). Using the Thought Disorder Index (TDI), which rates verbalizations for the presence of categories of mild to serious thinking problems, they found that age accounted for 6.73% of the thought disorder variance in scored Rorschach protocols. A similar developmental change in the level of disturbed thinking in normal children is observed in the age norms for the Comprehensive System for the Rorschach test (Exner & Weiner, 1995; Exner, 2003). The Weighted Sum Six (WSUM6) is the weighted index of thinking disturbance in the Comprehensive System. Although less complex and lacking the fine gradations of the TDI, the WSUM6, which is intended primarily for clinical use, declines fairly steadily in the nonpatient sample from a mean of 11.08 ($SD = 1.92$) in 5-year-olds to a mean of 2.30 ($SD = 1.34$) in nonpatient 16-year-olds. Given that the mean for nonpatient adults is 1.91 ($SD = 1.47$), this suggests that the frequency of verbalizations that fulfill the operational definition of *thought disorder* within the Comprehensive System is normally significantly higher for young children and declines steadily with normal growth and development. It is this normal age-related decline in thought disorder in normal children that led to the development of an age-adjusted weighting for this variable in both the Schizophrenia Index (SCZI) and the Perceptual and Thinking Index (PTI), which are the indices of psychosis in the Comprehensive System.

Both the TDI and the WSUM6, which are based on coding of verbalizations by a subject to a standard stimulus, elicit measurable lapses in thinking in nonpatient children that decline in frequency and severity with increasing age. However, not all methods for assessing thinking disturbance show this developmental trend. For example, Berstein and Loucks (1989) did not find a decrease in more global appraisals of bizarre content, contradiction of reality, and cluster thinking on the Rorschach between the ages of 5 and 12. Bolton, Dearsley, Madronal-Luque, and Baron-Cohen (2002) developed the Magical Thinking Questionnaire (MTQ) to assess disturbed thinking in children. This measure uses a forced choice format (i.e., yes/no/maybe) to assess beliefs concerning whether it is possible to make an event occur just by thinking about it, or to make things happen through an action that is rationally or causally unrelated to the event. A study of 127 children (ages 5–17) who were above the 50th percentile in ability revealed excellent test-retest reliability and a normal distribution for each age group. Unlike the data obtained from nonquestionnaire measures, the incidence of magical thinking observed with the MTQ did not decrease between the ages of 5 and 17.

As these examples suggest, not all psychometric methods are equally likely to elicit evidence of disturbed thinking or to show a developmental trend in the thinking of normal children. If one accepts the conclusion that thinking normally does become more coherent and conventional, and is more adequately communicated as children mature, then measures of thinking in children should reflect this trend. This then calls into question the validity and utility of those assessment methods that do not reflect this developmental trend.

Diagnostic Considerations

Thinking disturbance is often treated as though it were nearly synonymous with schizophrenia or the schizophrenic-spectrum disorders. Although disturbed thinking constitutes one of the DSM-IV criteria for this diagnosis, it clearly represents a measurable form of psychological dysfunction that occurs across a wide range of diagnostic entities. With the use

of such diverse measures of thinking disturbance as the TDI (Johnson & Holzman, 1979), the Rorschach (Comprehensive System; Exner, 2003), the Kiddie Formal Thought Disorder Rating Scale (K-FTDS; Caplan, Guthrie, Tanguay, Fish, & David-Lando, 1989), and the Bizarre-Idiosyncratic Thinking Scale (BITS; Marengo, Harrow, Lanin-Kettering, & Wilson, 1986), disturbed thinking has been documented in children with early-onset schizophrenia (Caplan, Foy, Asarnow, & Sherman, 1990; Caplan, Guthrie, & Foy, 1992; Caplan & Sherman, 1990) and children with schizotypal personality disorder (Asarnow & Ben-Meir, 1988; Caplan & Guthrie, 1992; Russell, Bott, & Sammons, 1989; Tompson, Asarnow, Goldstein, & Miklowitz, 1990). It has also been reported in nonhospitalized, nonpsychotic children of mothers hospitalized with affective psychotic disorders and other children at high risk with schizophrenic mothers (Arboleda & Holzman, 1985).

Clinically significant elevated WSUM6 has also been identified in children with post-traumatic stress disorder (Holaday, 2000), with mildly elevated levels also found in sexually abused girls (Leifer, Shapiro, Martone, & Kassem, 1991). Even gifted children have been found to have higher levels of thought disorders as measured by CS WSUM6 than the children in nonpatient comparison samples (Gallucci, 1989), although a review of this study indicates significantly fewer instances of more severe critical special scores. Children with Asperger's Disorder and High Functioning Autism have not been found to demonstrate impaired WSUM6 levels (Holaday, Moak, & Shipley, 2001; Ghaziuddin, Leininger, & Tsai, 1995). Although one study employing Exner's WSUM6 found no elevation in children with Attention Deficit Hyperactivity Disorder (ADHD; Cotugno, 1995), Caplan's (K-FTDS) method indicated that children with ADHD have been found to demonstrate significantly higher levels of thought disorder than normal children, but lower levels of thought disorder than schizophrenic children (Caplan, Guthrie, Tang, Nuechterlein, & Asarnow, 2001). Using this method, these authors have also found elevated levels of thought disorder in children with seizure disorders (Caplan, Guthrie, Shields, & Mori, 1992; Caplan et al., 2002). Clearly, problems in thinking, although frequent and severe in psychotic disorders, are not limited to schizophrenic-spectrum disorders or to psychotic conditions *per se*.

There are at least three different ways of conceptualizing the diagnostic significance of thinking problems. From a psychodynamic perspective, disturbed thinking represents the emergence of primary process thinking (Blatt & Wild, 1976; Cameron, 1938; Holt, 1977; Rapaport, Gill, & Shafer, 1968). As Russ (1987) has pointed out, when this occurs one must determine whether primary process thinking and difficulties distinguishing reality from fantasy occur as a result of structural deficits, failures in ego development, and a lack of adequate repressive barrier, as opposed to more transitory disruption or adaptive regression. From this perspective, the reason for the emergence of disturbed thinking then determines its diagnostic implications. The challenge this perspective presents is to arrive at an empirically sound method for differentiating these hypothetical etiologies.

From the trait perspective, as articulated in Meehl's (1962) theory of schizophrenia, disturbed thinking signals the presence of the underlying dimension of schizotypy. The extent or severity of thought disturbance manifested by an individual reflects one's place on that dimension. Psychosis is viewed as a continuum, and thought disorder is one of several components of psychological functioning that are assessed to determine where, if at all, one falls on that continuum. Theoretically, significant thinking disturbance in childhood would imply a higher level of schizotypy and a greater long-term risk for the emergence of a schizotypal personality disorder or schizophrenia. Methods for assessing schizotypy in children have been developed (e.g., Rawlings & MacFarlane, 1994; Eysenck & Eysenck, 1976). As Rawlings, Claridge, and Freeman (2001) point out, these scales index a diverse range of characteristics.

They are not intended to specifically assess thinking, although it would be expected that children who are more “schizotypal” on these measures would be more likely to have problems in thinking.

From a neuropsychological perspective, the problems in logic and conceptualization that fall within the rubric of *thought disorder* are among the many problems in cognition that are found in many psychiatric disorders, particularly the schizophrenic-spectrum disorders. Psychopathologists studying schizophrenia have argued that the term *thought disorder* is in itself misleading and should be re-labeled as *communication failure* (Docherty, 2005). These authors feel that this change in terminology helps to clarify the cognitive nature of these problems. When these communication failures occur in conjunction with the other cognitive impairments that have been associated with schizophrenia, they form a neuropsychological constellation consistent with that diagnosis. These include problems in complex attention, executive functioning, working memory, and verbal learning (Asarnow, Brown, & Strandburg, 1995; Asarnow, 1999; Cornblatt & Obuchowski, 1997; Ehrlenmeyer-Kimling, 2000; Ehrlenmeyer-Kimling et al., 2001; Kumra et al., 2000).

From the neuropsychological point of view the assessment of cognition, including the assessment of thought disorder, is central to the differential diagnosis of psychiatric conditions. The presence of the characteristic neuropsychological impairments of schizophrenia would suggest the presence of that disorder, regardless of the age of the patient. As fewer of the neuropsychological deficits associated with schizophrenia are detected, that diagnosis is less likely to apply. Although thought disorder, or communication failure, is one such impairment, neither its presence nor absence would, by itself, confirm or rule out a diagnosis of schizophrenia. Rather, it merely provides one additional piece of the picture that defines that syndrome. At the same time, thought disorder, like any other cognitive impairment, could potentially occur in conjunction with many other conditions, or it could occur in isolation as a focal problem. It is neither pathognomonic nor exclusive of any particular diagnostic entity.

Methods of Assessment

If thought disorder is defined by the degree to which thinking is logical, conceptually clear and conventional, and comprehensibly communicated, then the assessment of thought disorder would ideally tap each of these elements in a reliable and valid manner. If thought disorder is seen as a continuum, then any method of assessment would ideally span as much of that continuum as possible in as fine a gradation as is practical and appropriate. Efforts to assess thinking disturbance have included interview methods, observer ratings, and performance-based procedures.

Interview. In evaluating the choice of interview techniques, one must differentiate between interview procedures designed to elicit symptoms of a psychotic disorder, such as the Diagnostic Interview Schedule for Children (DISC; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) or Childhood Interview for Psychiatric Syndromes (ChIPS; Rooney, Fristad, Weller, & Weller, 1999) versus those that are specifically designed to elicit, observe, and quantify disordered thinking. Although there is inevitably a correlation between diagnoses of psychotic disorders assigned on the basis of diagnostic interviews and the presence of disturbed thinking, this correlation simply reflects the fact that disturbed thinking is one symptom of psychosis. Since disordered thinking occurs outside of psychotic disorders, and a psychotic disorder can be diagnosed in the absence of disturbed thinking, this correlation provides an inadequate basis for the specific measurement of thinking disturbance.

The use of structured interview methods may present problems when applied to children, who are least reliable when reflecting on their own thoughts (Fallon & Schwab-Stone, 1994). The adequacy of response to a structured interview may vary as a function of verbal skills and language development, independently of the quality of that child's thinking. It will also be affected by the child's ability to recognize the difference between "real" and "make-believe." Both language skills and cognizance of the difference between reality and fantasy develop with age and may present problems for structured interviews that do not make use of developmental norms and therefore lack a psychometric method of accounting for these factors. Interviews also have demand characteristics that may affect children somewhat differently than they affect adults. One finding among those attempting to assess thought disorder per se appears to be that interviews that elicit conversational speech from patients appear to provide a more adequate basis for quantifying thought disorder than do those that more narrowly limit a subject's range of verbalization (Griffith, Mednick, Schulsinger & Diderichsen, 1980).

Because of perceived limitations of interviews with children due to limited speech samples, immature conversational skills, and the resistance commonly displayed by children below the age of nine when responding to interview questions probing for psychotic symptoms, Caplan and colleagues (1989, 1990, 2001) developed and refined the K-FTDS. This technique utilizes a game-like storytelling format to rate the presence of three independent thought disorder components: illogical thinking, loose associations, and cohesion. One problem noted by the authors with respect to the clinical use of the K-FTDS was the differing reliabilities obtained, depending upon the transcription method. The highest interrater reliabilities were obtained for written transcripts, then videotaped interviews, with the lowest reliability for audiotaped interviews (Caplan, Guthrie, Tanguay, et al., 1989). Thus, although analysis of children's discourse with the use of these methods does appear to provide meaningful measures of thinking disturbance, the requirement of the method may, as yet, be impractical for clinical use.

One structured interview that assesses disordered thinking along a continuum that includes both unusual beliefs (e.g., "Both ghosts and monsters are only make-believe") and psychotic symptoms is the Childhood Unusual Beliefs Scale (CUBSCALE; Viglione, 1996). This interview format combines the advantages of self-report and structured interview in that it contains some items that are merely answered in a yes/no format, and others where more probing is required to determine whether criteria have been met. The scale has been found to be moderately related to the presence of disordered thinking as measured by the Rorschach WSUM6 (Viglione, 1996).

Rating Scales. An alternative method that is often utilized in the assessment of children, particularly those who are not yet old enough to be assessed with common questionnaire instruments, is the use of rating scales based upon the responses of parents, teachers, clinicians, and other trained observers (see Fields et al., 1994; Guy, 1976; Spencer, Alpert, & Pouget, 1994; Thakur, Jagadheesan, & Sinha, 2003). Behavior ratings by parents are often used in the assessment of various aspects of psychopathology in children. However, the accuracy of parent ratings will inevitably vary with the parents' ability to observe subtle aspects of behavior and to recognize that they are abnormal. It appears, however, that parents are not always equally adept at observing and rating all forms of psychological and behavioral disturbance. For example, Russell (1994) found that it is not unusual for schizophrenic children to have been experiencing psychotic symptoms that had not been obvious to parents or teachers.

Although parents, teachers, and others may be quite reliable in their observation of problems in overt behavior (e.g., aggression, bed-wetting, hyperkinetic behavior, etc.), their ratings

of events that are inherently private (e.g., hallucinations) may be much less accurate. Their rating of phenomena that can only be observed through the child's verbal behavior (e.g., delusional beliefs, bizarre or illogical thinking) appears to be less accurate (e.g., Ferdinand, Van der Ende, & Verhulst, 2004) and depends upon both the child's level of verbal activity in general and their specific inclination to verbalize strange beliefs, peculiar ideas, and illogical reasoning. Parent ratings are also limited by the extent to which they attend to the things their children say and have the ability to recognize thinking that is developmentally abnormal or pathological. Both the presence of unusual thoughts and the child's willingness to verbalize strange ideas appear to be age-related, and this may differentially affect the sensitivity of parent ratings of thought disturbance. Parents who are unclear about the extent to which unusual thinking is common in children may overrate that symptom, whereas others may dismiss pathological thinking verbalized by a child on the mistaken assumption that this is common in that age group. To the extent that children are less likely to clearly articulate disturbed thinking in their daily life and parents lack a clear sense of the quality of thinking that is developmentally normal, rating scales are likely to be a less sensitive method of detecting and quantifying disturbed thinking in children.

In addition to the inherent problems in using observer ratings to quantify subjective phenomena, most behavior rating scales are aimed at providing information relevant to the diagnosis of the most commonly occurring psychiatric disorders. For this reason, thinking disturbance is often not afforded the range of coverage required for adequate measurement. Moreover, because factor structures and scales are developed in populations with relatively low incidence of psychosis, disturbed thinking, hallucinations, delusions, bizarre behaviors, and other symptoms of psychosis are often lumped into one heterogeneous scale or distributed across other scales that share some aspects of the construct. Clinicians attempting to synthesize data from different instruments are faced with the prospect of interpreting parent ratings with heterogeneous item content, labeled somewhat misleadingly as "Thought Problems" (Achenbach, 1991), "Autism" (Naglieri, Lebuffe, & Pfeiffer, 1994), or "Reality Distortion" (Lachar & Gruber, 2001), which typically contain some item content related to disordered thinking, but also include other item content related to the occurrence of other symptoms ordinarily reflective of psychotic levels of disturbance. Although research has supported the ability of rating scales to differentiate children with psychotic disorders (Kline, Lachar, & Godowski, 1987; Lachar, Godowski, & Snyder, 1984; Smith & Reddy, 2002; Smith, Reddy, & Wingenfield, 2002), the applicability of these scales to the more precise problem of identifying thinking disturbance has not been as adequately studied.

Performance-Based Methods. Although rating scales and interview methods have their place in the assessment process, some psychological phenomena can best be assessed by presenting an individual with a task that challenges a psychological process, and then measuring his or her performance in response to that challenge. For example, one could assess vocabulary by rating the level of complexity of the subject's language during an interview, or by asking parents or teachers to rate the subject's vocabulary on a scale. It is likely that these would correlate with each other and that both would correlate with the breadth and sophistication of the subject's actual vocabulary. However, even more precise measurement might be achieved with a standardized vocabulary test. Challenging the specific area of functioning in this fashion can at times provide a more accurate index of an attribute of interest. Few would argue that speed at running is better assessed by remarks during an interview or ratings by parents, than by actual timing of an individual as he or she attempts to run a fixed distance. Moreover, the structure of this method allows for the development of

increasingly effective procedures for eliciting the performance of interest and allows for the development of normative data sets. Normative data, in turn, provide a more precise estimate of the extent to which a performance is unusual, and allow the paradigm to take into account age, gender, or any other characteristic that is critical to understanding the significance of the performance.

Performance-based measures have been developed for the assessment of thought disorder. These measures include interview procedures such as the K-FTDS (Caplan et al., 1989), as well as ratings such as BITS (Marengo, Harrow, Lanin-Kettering, & Wilson, 1986) and TDI (Johnson & Holzman, 1979), which have been applied to disturbed thinking elicited in response to the Wechsler Scales (Skelton, Boik, & Madero, 1995; Armstrong, Silberg, & Parente, 1986) and Thematic Apperception Test stories (McCarthy et al., 2003). Although comparison of severity of thought problems across different types of measures has been found to have diagnostic significance in adolescents (Weiner, 1966; Skelton, Boik, & Madero, 1995; Armstrong, Silberg, & Parente, 1986), no studies appear to have examined such differences in children. The Rorschach test appears to be the most widely used performance-based measure of disturbed thinking. Within the CS (Exner, 2003), which is the most frequently used method of administering and scoring the Rorschach in clinical settings, the subject is asked to provide responses to the 10 standard inkblot stimuli and is then asked to show the examiner what part or parts of the inkblot were used in the response and to explain which characteristics of the inkblot (e.g., color, shape, shading, etc.) were the basis for the response. This paradigm challenges the subject with a cognitive demand (i.e., What might this [inkblot] be?) and then requires an articulation of the basis for his or her thinking (i.e., What made it look like that?). The Rorschach allows for articulation of a broad range of responses, thereby enabling the subject to display the conventionality of his or her conceptualizations, the logic of his or her thinking, and the adequacy of his or her communications. At the same time, it requires a response to standardized stimuli in the context of a standardized presentation procedure and provides the examiner with specific operational rules for coding the occurrence and severity of a specific set of problems in thinking. The frequency and severity of those problems are then calculated and can be compared with a variety of normative samples, beginning at age five and continuing up to adulthood.

The thought disorder variables of the CS can be coded reliably (Exner, 2003; Exner & Weiner, 1995; McGrath et al., 2005) in clinical settings. The composite variables that index thought disorder, such as the Perceptual and Thinking Index (PTI; Exner, 2003) and Ego-Impairment Index (EII-2; Viglione, Perry, & Meyer, 2003) in the CS are correlated in the expected manner in child samples with the presence of psychotic disorders (Smith, Baity, Knowles, & Hilsenroth, 2001; Stokes, Pogge, Grosso, & Zaccario, 2001) and relapse of psychotic symptoms (Stokes et al., 2003). Thus, this method would appear to have particular advantages in the clinical assessment of thinking disturbance in general and in the assessment of thought disorder in children and adolescents in particular.

THE FOUR WINDS STUDY

In order to explore the relationship among thought disorder variables and between thought disorder variables and global indicators of psychosis, we analyzed archival data from the child inpatient assessment service at Four Winds Hospital. Four Winds is a private psychiatric facility in the suburbs of New York City that specializes in the treatment of children and adolescents. More than 300 of the over 1500 children and adolescents hospitalized at Four

Winds each year undergo comprehensive psychological testing as part of their standard clinical care. The cases used in the following analyses were extracted from those archival data of the psychological assessment service of the hospital from children between the ages of 5 and 12 years ($M = 9.73$; $SD = 1.9$) who had been administered the CUBSCALE. The sample was predominantly male (72%) with heterogeneous discharge chart diagnoses, including Schizophrenia (<1%), Psychotic Disorder NOS (17.5%), Mood Disorder with Psychotic Symptoms (3.5%), Mood Disorders without Psychotic Symptoms (50.6%), and disruptive behavior disorders, including Oppositional Defiant Disorder, Conduct Disorder, Intermittent Explosive Disorder, and Impulse Control Disorder NOS (24.3%), Pervasive Developmental Disorders (1%), and Post-Traumatic Stress Disorder (2.5%).

The measures that were analyzed included the Rorschach, Devereux Scales of Mental Disorders (DSMD), ChIPS, and the CUBSCALE. With respect to the Rorschach, the reader is referred to Exner (2003) for a description of the development and characteristics of the critical special scores, and to Exner and Weiner (1995) for a description of their use in making clinical inferences with children. These include scores for deviant verbalizations (DV), which represent the strange or unconventional use of words; deviant responses (DR) for tangential or irrelevant commentary introduced in ways that disrupt communications; incongruous combinations (INCOM), fabulized combinations (FABCOM), and contaminations (CONTAM) for the combination of ideas in unconventional and inappropriate ways; and illogical reasoning (ALOG). Each of these is specifically defined, and DV, DR, INCOM, and FABCOM are all further coded for greater (e.g., DV2, DR2, INCOM2, FABCOM2) and less (e.g., DV1, DR1, INCOM1, FABCOM1) severity. The DSMD was studied with the use of those scales identified most closely with psychotic disorders (i.e., Autism, Acute Problems, and Critical Pathology), as well as item content that specifically relates to the construct of thought problems (Lebuffe, Naglieri, & Pfeiffer, 1996) (i.e., items 79, 97, 92, 94, 84) and hallucinations (item 106). The ChIPS, which is a structured interview, elicited clinical judgments with respect to the presence in this sample of auditory hallucinations (14.3%), visual hallucinations (7.8%), or delusional symptoms (10.4%), with 19.5% of the children in the sample ($N = 114$) meeting criteria for a psychotic disorder. This rate was consistent with the base rates of psychotic disorders within the larger child inpatient sample.

Relationships among Global Indicators of Psychosis

Table 23.1 indicates that the structured interview (ChIPS) and medical chart diagnoses of psychosis were correlated at lower levels than would be anticipated, perhaps revealing some limitations of the interview technique with children. Aside from intercorrelations within components of each assessment method, there were only modest relationships among various global indicators of psychosis. None of the DSMD scales correlated with either ChIPS or chart diagnosis of a psychotic disorder. However, PTI and EII-2 showed significant correlations with both chart and ChIPS diagnoses of psychotic disorders.

Relationships among Global Measures of Thought Disorder

In order to study the phenomenon of parent ratings of thinking disturbance more closely, a composite scale was developed from those DSMD items that are typically described as measuring "thought problems." A review of Table 23.2 reveals that this scale is correlated significantly with the child's report of delusional symptoms on the ChIPS but did not correlate significantly with the CUBSCALE. The Rorschach WSUM6 was significantly correlated

TABLE 23.1.
Correlations among Global Measures of Psychotic Symptoms

	<i>DSMD</i>		<i>Rorschach</i>		<i>ChIPS</i>	<i>Chart</i>
	<i>Acute</i>	<i>Crit. path.</i>	<i>PTI</i>	<i>EII-2</i>	<i>Dx</i>	<i>Dx</i>
DSMD						
Autism	.66** ^a	.88** ^a	-.27 ^b	-.22 ^b	.04 ^c	-.09 ^a
Acute prob.	—	.94** ^a	.12 ^b	.21 ^b	.08 ^c	.13 ^a
Crit. path.	—	—	-.07* ^b	-.06 ^b	.08 ^c	.02 ^a
Rorschach						
PTI			—	.75** ^d	.22* ^d	.33** ^d
EII				—	.34** ^d	.24** ^d
ChIPS Dx					—	.25* ^e

^a*N* = 49; ^b*N* = 38; ^c*N* = 28; ^d*N* = 114; ^e*N* = 92.

with both the ChIPS and the CUBSCALE but was not correlated with DSMD ratings on items specifically rating elements of disturbed thinking.

Relationships between Thought Disorder Measures and Indicators of Psychosis

Table 23.3 presents a more comprehensive pattern of relationships between thought disorder and psychosis measures. In reviewing the specific DSMD item content rated by parents, it is important to note that most of the items measuring thought problems were correlated with ratings of hallucinations. However, none of the DSMD items or scales were significantly related to any finding of psychotic symptoms on structured interview or to the chart diagnoses.

Before interpreting the findings related to the Rorschach test, it is important to note that for the sample (*N* = 114), there were significant intercorrelations among all of the variables that make up the PTI. As has been found for adult samples, WSUM6 was correlated ($r = .27$) with perceptual inaccuracy ($X - \%$). Although the procedure for coding poor human representations (PHR) and good human representations (GHR) may artificially inflate the correlations, it is important to note that WSUM6 also correlated strongly ($r = .40$) with the presence of PHR and less strongly ($r = -.22$), in an inverse fashion, with the presence of GHR. These findings are consistent with those obtained for adult subjects that indicate moderate relationships among the constructs of perceptual accuracy, thinking disturbance, and

TABLE 23.2.
Correlations among Global Measures of Thought Disorder

	<i>Rorschach WSUM6</i>	<i>CIPS thinking problems</i>	<i>CUBSCALE Total</i>
DSMD thought prob. items	.07 ^b	.44* ^c	.26 ^f
WSUM6	—	.21* ^g	.25* ^d
ChIPS thinking	—	—	.47** ^e

^a*N* = 49; ^b*N* = 38; ^c*N* = 28; ^d*N* = 114; ^e*N* = 92; ^f*N* = 48; ^g*N* = 87.

TABLE 23.3.
Correlations among Thought Disorder Measures and Psychosis Indicators

	<i>DSMD</i> <i>halluc</i>	<i>ChIPS</i> <i>aud</i> <i>hall.</i>	<i>ChIPS</i> <i>vis.</i> <i>hall.</i>	<i>ChIPS</i> <i>del.</i> <i>Sx</i>	<i>ChIPS</i> <i>psy</i> <i>dx</i>	<i>Chart</i> <i>psy</i> <i>dx</i>
DSMD	(<i>N</i> = 48)	(<i>N</i> = 28)	(<i>N</i> = 28)	(<i>N</i> = 28)	(<i>N</i> = 28)	(<i>N</i> = 48)
Dis. speech	.18	.02	.17	.23	.13	-.12
Real/fantasy	.39**	.08	.27	.34	.15	-.10
Sp. powers	.39**	-.05	.23	.19	.23	.17
Confused	.05	-.17	.01	.04	-.03	-.01
Makes up words	.29*	.14	.25	.28	.26	-.06
Autism scale	.37*	-.09	-.05	-.09	.04	-.09
Rorschach	(<i>N</i> = 37)	(<i>N</i> = 87)	(<i>N</i> = 87)	(<i>N</i> = 87)	(<i>N</i> = 87)	(<i>N</i> = 114)
Sum level 1	.09	.14	.16	.16	.11	.15
DV2	.12	-.03	.02	.26*	.16	.27**
DR2	-.06	.09	.04	.26*	.02	.06
INC2	-.04	.16	.09	.09	.12	.02
FAB2	.53**	.40**	.20	.17	.33**	.34**
ALOG	.36**	.04	.20	.03	.03	.38**
CONTAM	.18	.09	.19	.27	.24*	.41**
WSUM6	.31	.31**	.25*	.25*	.26*	.34*
M minus	.19	.35**	.19	.25*	.32**	.02
X minus %	.19	.10	.21*	.26*	.16	.15
PTI	.25	.24*	.19	.19	.22*	.33**
EII-2	.26	.36**	.31**	.31**	.34**	.25**
	(<i>N</i> = 48)	(<i>N</i> = 92)	(<i>N</i> = 92)	(<i>N</i> = 92)	(<i>N</i> = 92)	(<i>N</i> = 151)
CUBSCALE	.53**	.56**	.40**	.47**	.52**	.20*

p* < .05; *p* < .01.

object representations (Berg, Packer & Nunno, 1993; Quinlan, Harrow, and Tucker, 1972). However, in the entire child inpatient sample, (*N* = 665), only 6.2% of the Rorschach protocols included impaired thinking (WSUM6 above cutoff) without impaired perceptual accuracy (*X* - % GT .29), whereas 43.1% demonstrated impaired perceptual accuracy without thinking problems. A careful understanding of the presence of all components is most likely to elucidate diagnostic status.

A review of Table 23.3 indicates that the components of the PTI are related to parent ratings and child self-report of hallucinations, and both ChIPS and chart diagnosis of psychotic disorder. The variables contained within the mild levels of thinking disturbance did not independently predict the presence of psychotic symptoms. Thinking problems, more precisely defined by WSUM6, were related to parent ratings of both hallucinations and delusional symptoms, as well as the determination of all psychotic symptoms in the structured interview. By contrast, perceptual inaccuracy (*X* - %) was only related to the presence of delusional symptoms. However, an analysis of the composite measure (PTI) reveals that only 3.1% of those with PTI = 0 were rated as displaying frequent hallucinations or very frequent hallucinations on the DSMD, whereas 34.4% of children with PTI = 5 were rated as such. Although the general trend is for the composite variables (i.e., PTI, EII-2) to be more strongly related to psychotic symptoms, some variables, such as FAB2 and M-, appear to be

capable of independently predicting status across a range of psychotic symptom indicators. These data additionally lend support to the CUBSCALE as a measure of disordered thinking, since it was significantly correlated with WSUM6 ($r = .25$) as well parent ratings, and both ChIPS and chart ratings of Psychotic disorder.

These findings illustrate the value of a multicomponent assessment, the low convergence among various methods for assessing the presence of thinking problems, and the difficulties associated with relying solely on interview or behavior ratings in the attempt to assess thinking problems in children. They demonstrate the clinical value of utilizing performance-based measures such as the Rorschach, which was more strongly related to discharge chart diagnoses of psychotic disorders than either interview or parent ratings. They also suggest the need for clinicians to develop more refined ways of examining the subcomponents of more global rating scales measuring psychotic behaviors. Finally, although these data clearly indicate that thinking problems are moderately related to the presence of other psychotic behaviors, they also highlight the value of viewing thinking problems as a separate construct that needs to be understood within a context of other features in order to determine diagnostic and prognostic significance.

Case Example

This case concerns Barbara, an eight-year-old female child who was hospitalized twice within a two-month period. Because she was enrolled in a hospital quality assurance study at the time of her first hospitalization, she received the typical clinical evaluations that occurred during these hospitalizations, as well as additional evaluations included in that quality assurance project. These included parent ratings using the DSMD at the time of her first admission to the hospital, and at 30 and 120 days after her discharge from that admission. During both admissions Barbara's symptoms were rated by her treating physician. Her behaviors were also rated by the nursing staff at the end of her first hospital stay. A structured diagnostic interview (i.e., K-SADS) involving both Barbara and her mother was completed by the quality assurance research team during her first hospitalization. Finally, during her second hospitalization, which took place four weeks after her discharge from her first hospitalization, a psychological test battery was completed that included the Rorschach test. At the end of her initial hospital stay, which was approximately one week in duration, her diagnosis by the clinical treatment team was (DSM-IV 299.33) major depressive disorder, recurrent, severe, without psychotic symptoms. At neither the beginning nor the end of that hospitalization did Barbara's therapist rate her as displaying any hallucinations, delusions, or thought disturbance. The K-SADS, completed independently by the research team, also diagnosed a major depressive episode and indicated neither psychotic symptoms nor any evidence of thought disturbance at that time. Thus, neither interview nor clinical observation suggested any disturbance in thinking at that time. Ratings on the DSMD are presented in Table 23.4.

The mother's ratings, which reflect the child's behavior in the four weeks before her hospitalization, indicate significant depressive symptomatology and a host of odd behaviors, but no endorsement of any items that specifically refer either to disturbed thinking or to clear symptoms of psychosis. These ratings were different from nursing staff ratings obtained during Barbara's first hospitalization, which indicate no clinically significant problems within the highly structured setting provided by the hospital, nor any behaviors reflecting either disturbed thinking or psychosis.

TABLE 23.4.
Ratings on the Devereaux Scale of Mental Disorders (DSDM)

<i>Scale/composite T-score</i>	<i>Mother 1st admission</i>	<i>Nursing staff 1st admission</i>	<i>Mother 2nd admission</i>
Conduct	67	40	75
Attention	63	40	73
Externalizing	66	40	76
Anxiety	49	43	47
Depression	80	60	58
Internalizing	65	51	52
Autism	48	40	65
Acute problems	83	46	46
Critical pathology	67	42	56
Total	68	43	63

Three weeks after discharge from her first hospitalization, Barbara was readmitted to the hospital because of increasingly aggressive and disruptive behaviors, both at home and at school. Neither psychotic symptoms nor evidence of disturbed thinking was noted by the admitting physician. Diagnoses of bipolar disorder, major depressive disorder, oppositional defiant disorder, and borderline personality disorder were considered. Mother's DSMD ratings of Barbara's behavior during that time indicate more severe problems in conduct and odd and socially inappropriate behaviors, with no signs of anxiety or depression. For the first time, her ratings also include an endorsement of one of the eight items on the DSMD that refer to problems in thinking. To the item "have difficulty separating fact from fantasy" the mother assigns a rating of "Occasionally." No other psychotic-like behaviors were noted.

On the ninth day of her second hospitalization, Barbara completed a comprehensive psychological test battery. This was requested in response to the treatment team's continuing uncertainty regarding this child's diagnosis. Her test performance included a WISC-III Full Scale IQ of 109, Verbal IQ of 113, and Performance IQ of 103. Variable attention was observed on some of the neuropsychological tests in that battery, including the Wisconsin Card Sorting Test (Heaton, Chelune, Talley, Kay, & Curtiss, 1993) and the Continuous Performance Test (see Borgaro, Pogge, DeLuca, & Stokes, 2003, for description), but no significant or consistent impairment was evident. Both reading and math achievement were in the average range. The CS Rorschach yielded a valid and interpretable record ($R = 14$; $\Lambda = 0.00$). Her score on the depression index (DEPI = 6) was reflective of the likelihood of a mood disorder and was consistent with her symptomatic presentation. As these data indicate, she displayed a pattern of disturbed thinking in the context of intact perceptual accuracy, which is unusual for inpatient samples. Her Rorschach scores on the variables critical to the assessment of thinking disturbance and psychosis are presented in Table 23.5.

To this point few psychotic symptoms had been observed by the patient's mother, her psychiatrist, or the nursing staff. No evidence of thinking disturbance had been elicited or observed in either of her hospitalizations or in the structured diagnostic interview completed by a trained research team. Little consideration was being given to the possibility of a psychotic disorder. However, in response to the stimuli of the Rorschach, this child's thinking,

TABLE 23.5.
Summary of Key Rorschach Structural Summary Findings

<i>Sum 6</i>	= 17	<i>DV2</i>	= 0	<i>XA%</i>	= 0.57	<i>PTI</i>	= 4
Level 2	= 8	DR2	= 6	WDA%	= 0.57	SCZI	= 4
Wsum6	= 88	INC2	= 1	X-%	= 0.21	GHR	= 0
M-	= 2	FAB2	= 1	X+%	= 0.21	PRH	= 10
M none	= 0	ALOG	= 5			EII	= 5.39
		CONTAM	= 1				

as reflected in her Wsum6 of 88, was markedly more disturbed than is normative at her age (eight-year-old Wsum6: $M = 14.33$; $SD = 5.10$). Thus, this performance-based procedure elicited evidence of a thinking disturbance not readily detected by other means.

At 120 days after discharge from her first hospitalization (approximately two months after completion of her second hospitalization), Barbara's mother again rated her behavior during the prior 30 days. Her DSM-D ratings are presented in Table 23.6.

At this point, four months after the completion of her first hospitalization, every scale was significantly elevated, with conduct problems and depression most prominent, but with the mother now rating three of the disturbed thinking items as occurring (i.e., have difficulty separating fact from fantasy, say that people were against him/her, and appear obsessed or preoccupied with a specific object or idea). Subsequent to the completion of this quality assurance study, this child was hospitalized for a third time. At that time, Barbara was determined to be actively psychotic by the admitting psychiatrist.

Initially clinical observation, parent ratings, and structured interviews failed to detect problems in thinking that emerged quite prominently in response to a performance-based measure (i.e., Rorschach). Diagnoses formulated prior to the performance-based assessment tended to focus on Barbara's distress (i.e., major depressive disorder) and behavior problems (i.e., rule out oppositional defiant disorder). Both of these sets of problems clearly disappeared within the structured and supportive environment of the hospital, only to reemerge each time with greater severity very shortly after she left that setting. Only several months later did Barbara's problems in thinking and reality testing become sufficiently severe to be detected by clinical interview or parent observation, although the trajectory of

TABLE 23.6.
Barbara's Parent DSM-D Ratings at 120-day Follow-up

<i>Scale T-scores</i>	<i>120-day follow-up</i>		
	<i>T-scores</i>	<i>Composite</i>	
Conduct	79	Externalizing	74
Attention	65	Internalizing	77
Anxiety	70	Critical pathology	70
Depression	80	Total	76
Autism	66		
Acute problems	69		

this case suggests that these thinking problems, and the psychiatric condition underlying them, are likely to have been critical to her distress, her behavior problems, and her repeated failure to respond to treatment.

SUMMARY

The adequacy of thinking is a critical facet of psychological functioning. Disordered thinking is an important symptom too often assumed to be subsumed within diagnostic categories (e.g., schizophrenia) or related constructs (e.g., psychosis), and as a result its contribution to an individual's functioning is obscured. However, it is neither specific to any diagnosis nor an inevitable feature of any condition. Moreover, assessment of this crucial clinical construct in children is complicated by the developmentally normal evolution of thinking with age. Methods for assessing thinking in children must incorporate some means of addressing these developmental trends.

While rating scales, structured interviews, and performance-based methods have been developed for the assessment of thinking problems, they do not always show the desired convergence; the demands those methods place on younger patients may sometimes make them less suitable for children. The clinical significance of detectable thinking problems in children highlights the need for additional research aimed at improving existing assessment methods and developing new technologies for the detection and quantification of thought disorder in children. Reliable measurement of thought disorder will inevitably precede an understanding of its causes and the development of more effective treatments.

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